

DESIGN AND FABRICATE AN EXHIBITION RACK

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ABSTRACT

Manufacturing is a process of converting raw material into product. It can be described the transformation of materials into items of greater value by means of one or more processing and/or assembly operations. The study of manufacturing was very important in order to carry out this project to ensure that student understand on what are needs to do. This project is about designing and fabricating the Exhibition Rack that can be used to display many item.. This project involves the process of designing the exhibition rack by considering the shape, functionality, durability and manufacturing costs for people to use it. The material of this design is easy to gain it, because it only using rectangular steel, sheet metal, L- shapes steel and Perspex. So that the method joining that can be compatible in assembled this exhibition rack, rivet pop process and welding processes. This project also required analysis to make sure the strength of the product and ensure the safety for the user indeed of publishing. After all the process had been done, this clothesline may help us to understand the fabrication and designing process that involved in this project.

ABSTRAK

Bidang pembuatan adalah satu proses mengubah bahan mentah kepada produk. Ianya boleh diertikan sebagai mengubah material kepada sesuatu yang berguna dalam erti melakukan beberapa proses atau proses penyambungan. Pembelajaran bidang pembuatan adalah penting kepada pelajar supaya mengetahui akan proses dan perkara yang perlu dilakukan. Projek ini bertajuk merekabentuk dan menghasilkan rak pameran yang boleh digunakan untuk mempamerkan sesuatu. Projek ini mengandungi proses merekebentuk rak pameran dengan mengambil kira bentuk, kepelbagaian fungsi, ketahanan dan kos pembuatan kepada pengguna. Bahan untuk menghasilkan produk mudah diperolehi, kerana ia hanya menggunakan besi segi empat sama, besi berbentuk L dan perspex. Kaedah dalam proses untuk menyambung bahagian- bahagian dalam penghasilan rak pameran seperti proses merivet dan proses kimpalan. Projek ini juga memerlukan analisis kekuatan produk untuk memastikan keselamatan kepada pengguna. Setelah selesai semua proses, rak pameran ini dapat membantu tentang kefahaman dalam proses merekabentuk dan menghasilkan.

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CHAPTER 1

INTRODUCTION

1.1 Project Synopsis

These project titles are design and fabricate an exhibition rack. The characteristic of this product is light in weight and user friendly for any items to be displayed. This exhibition rack produces by L-shape steel, rectangular shape steel and Perspex. This product has been design by using solid work software and fabricates using MIG welding to joining the part produce by steel, and rivet for part using Perspex. Other machine used in fabricate this exhibition rack is grinding as a function to cut the material using steel, hand grinding, knife to cutting the Perspex and drilling to get the hole in rivet process.

The concept of the Multi-purpose trolley is to user friendly for any items to be displayed. This trolley will primarily help staff especially members of Faculty of Mechanical Engineering to display their product in mechanical lab or other exhibition place. Thus, with the development of this exhibition rack, it is hope that it can contribute to give them ideas how to overcome problem in display any items at University Malaysia Pahang especially for Faculty of Mechanical Engineering staff.

1.2 Project Scopes

The project scope is limited to the below parameter:

- i. Design the exhibition rack using solid work software.
- ii. Fabrication the exhibition rack using metal inner gas (MIG) for welding method and revert pop.
- iii. Material to be used is L- shape steel, rectangular steel, prospect and sheet metal.

1.3 Project Objective

- i. To design an exhibition rack this is light in weigh, and user friendly for any items to be displayed.
- ii. To fabricate an exhibition rack which has been designed by using manufacturing process such as MIG welding, cutting, bending, and etc.
- iii. To find the best design by considering several characteristics and minimize the manufacturing cost through consideration in material selection.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

The new exhibition rack is designed to be user friendly for any items to be displayed. It's also light in weight and interesting. Nowadays the exhibition rack is the most important thing and in market demand because the exhibition is needed in business sectors. In market, the exhibition racks have more shape and produced by difference material. Example exhibition rack in the market is pop display rack, metal exhibition rack, and sway display.

This exhibition rack commonly produces by steel, sheet metal and Perspex. The items choose because strength, light in weight, easy to fabricate, and long life. The exhibition rack also commonly fabricate using welding method such as MIG welding to joining part using steel and rivet pop to join steel with Perspex. This method chosen because can produce the stiff exhibition rack, clean and interesting.

2.1 Paper Review

Several types of rack are follows:

i. Display rack

The display rack is to exhibition the small item like foodstuff, electric equipment and etc. This exhibition rack commonly used in super market, small shop and etc.

ii. Supermarket shelf

The supermarket shelf exhibition rack is used to exhibition the shoes and clothes.

iii. Ceramic exhibition

Function of the rack is to display the ceramic component and this rack always used in hardware shop.

iv. Fruit exhibition rack

Function of the rack is to display the fruit and this rack always used in super market.

2.2 Technical Review

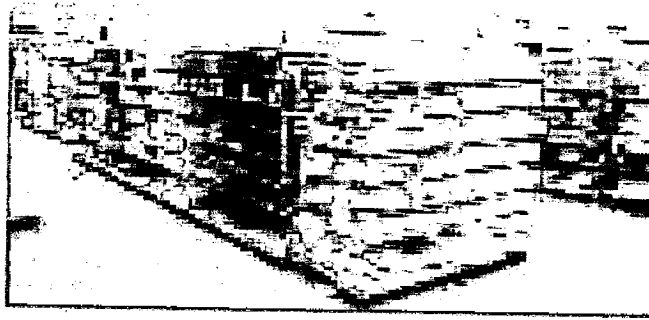


Figure 2.1: Display rack

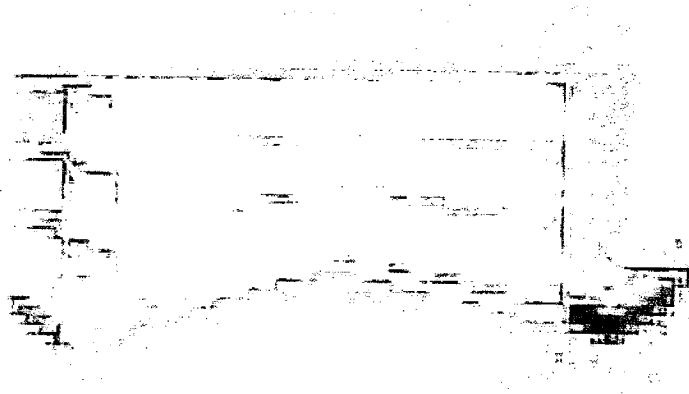


Figure 2.2: Supermarket shelf

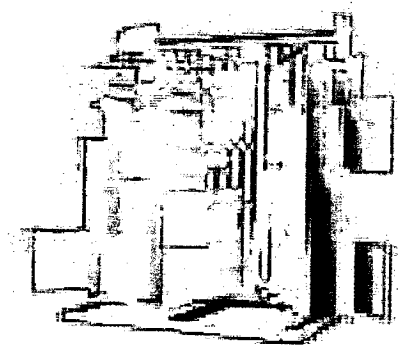


Figure 2.3: Ceramic exhibition

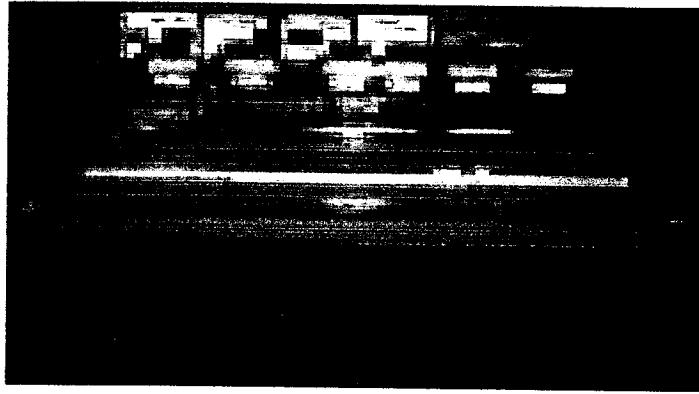


Figure 2.4: Fruit exhibition rack

2.3 Basic Part

- i. **Frame body**
The frame body of this exhibition rack produces by using L shape steel.
- ii. **Base**
The base of this rack produces by using the rectangular metal to produce the frame.
- iii. **Cover of body**
The covers of body produce by transparent plastic including the door.
- iv. **Cover of base**
The covers of the base produce by using sheet metal.

2.4 Joining Method of Welding Process

2.5.1 Basic Theory of Metal Inert Gas(MIG) Welding

This clothesline will be joined by using the permanent joint which is welding process. The method joining that be able to fabricate and assembled the frame is Metal Inert Gas (MIG) Welding.

Metal Inert Gas (MIG) Welding: An arc is struck between a consumable electrode and the sheet metal to be welded. The consumable electrode is in the form of continuous filler metal. An inert gas surrounds the arc and shields it from the ambient to prevent oxidation. Carbon steels, low alloy steels, stainless steels, most aluminum alloys, zinc based copper alloys can be welded using this process.

Gas Metal Arc Welding (GMAW) is frequently referred to as MIG welding. MIG welding is a commonly used high deposition rate welding process. Wire is continuously fed from a spool. MIG welding is therefore referred to as a semiautomatic welding process. The shielding gas, forms the arc plasma; stabilizes the arc on the metal being welded, shields the arc and molten weld pool, and allows smooth transfer of metal from the weld wire to the molten weld pool. There are three primary metal transfer modes which are spray transfer, globular transfer and short circuiting transfer.

2.5.2 The Advantages of MIG Welding

- i. High productivity, because based on this machine the consumer no need to stop their work to change rods or chip and brush the weld frequently.
- ii. Easy to learn and makes great-looking welds.
- iii. Can weld on stainless steel, mild steel, and aluminium.
- iv. This welding process also can be weld in all positions.

2.5.3 The Disadvantages of MIG Welding

- i. Can not check watch, count money, smoke cigarette, or talk to buddy as often.
- ii. Costs money of consumable, such as tips and nozzles.
- iii. Is not worth a dang on paint, rust, or dirty surfaces.
- iv. No good for thick steel, because it does not get the proper penetration.

2.5.4 Welding Gun and Wire Feed Unit

The figure below show the basic structure on the nozzle of the MIG welding.

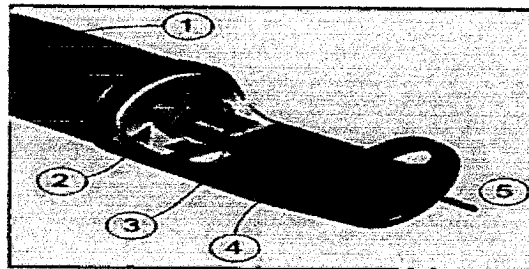


Figure 2.5: GMAW torch nozzle cutaway image.

(1) Torch handle, (2) Molded phenolic dielectric (shown in white) and threaded metal nut insert (yellow), (3) Shielding gas nozzle, (4) Contact tip (5) Nozzle output fac.

2.5.5 Process of MIG Welding

In spray transfer, small, molten metal droplets from the electrode are transfer to the weld area at a rate of several hundred droplets per second. The transfer is spatter-free and very stable. High Direct Current (DC) and voltages and large-diameter electrodes are used with argon or argon-rich gas mixture used as the shielding gas. The average

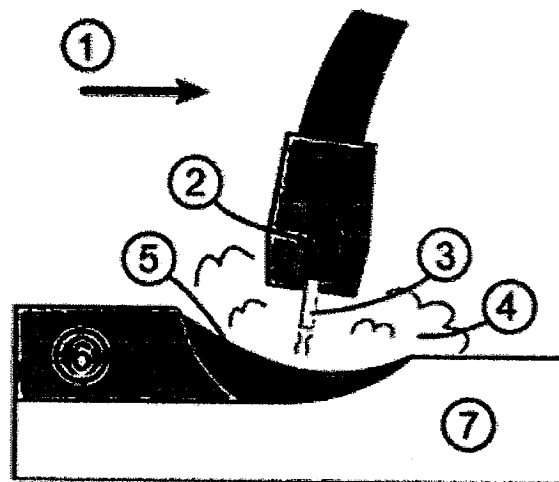


Figure 2.7: GMAW weld area

- (1) Direction of travel, (2) Contact tube, (3) Electrode, (4) Shielding gas, (5) Molten weld metal, (6) Solidified weld metal, (7) Work piece.

In most of its applications, gas metal arc welding is a fairly simple welding process to learn, requiring no more than several days to master basic welding technique. Even when welding is performed by well-trained operators, however, weld quality can fluctuate, since it depends on a number of external factors. And all GMAW is dangerous, though perhaps less so than some other welding methods, such as shielded metal arc welding.

Blind Rivets - Advantages of "Blind" POP Rivets

The ability to set POP rivets without the need for access at the back of the work makes their use mandatory in many instances. However, their many additional advantages make POP rivets the logical choice in numerous applications where the blind rivet setting feature is not of primary importance, such as:

- Low in-place costs
- Fast assembly
- Low-cost, lightweight, easily portable tools
- Vibration-proof assembly
- No surface marring
- Exceptional versatility
- High grip and pull-up strengths
- Tamperproof

Blind Rivets

Blind Rivets are multi-piece rivet assemblies, capable of being installed from one side of the work piece. Traditionally, blind rivets were used on aircraft leading edges, trailing edges, and close out areas which are limited to access to one side of the structure. Current blind rivet usage has expanded to many additional areas of the aircraft in an effort to decrease labor expense and to address the ergonomic issues of solid riveting.

How They Work

A blind POP rivet consists of two parts: the rivet body and, within the setting mandrel. As shown in the accompanying illustration at left:

1. The POP rivet body is inserted in a hole in the materials to be joined.
2. The tool is actuated and the jaws of the power-operated or manual POP rive tool grip the mandrel of the rivet.

The rivet is set by pulling the mandrel head into the rivet body, expanding it, and forming a strong, tight, reliable joint. At a predetermined setting force, the mandrel breaks and falls away.

Typical Applications

- Air bags
- Appliances
- Overhead doors
- Truck trailers
- Acoustical ceiling
- Personal watercraft
- Overhead lighting

Types of POP Rivets

Open End

Wide POP rivets range. Providing strong, low cost fastenings, open-end rivets are ideal for a wide variety of applications.

Closed End

Where fastenings have to be water or pressure tight, and 100% mandrel head retention is required.

Soft Set

Soft-Set POP Rivets incorporate a body and mandrel of special aluminum alloys.

Multi Grip

Wide grip range, ideal for use in inconsistent holes, reduced rivet inventory.

HR Rivet

High Retention Rivets for Metal and Plastic-to-Metal Applications

Ultra Grip

Provide superior holding power over other high strength rivets.

T-Rivet

Designed for structural and similar high strength applications.

LSR (Load Spreading Rivet) POP Rivets

Rivet Designed especially for plastics and other brittle or soft materials

Easy Entry

Easy Entry Rivets line up odd shaped or misaligned holes in multiple sheets of material to make production easier and faster.

Grooved Rivet

Designed to set within a hole in fibrous materials such as wood. When the rivet sets, the body shortens and the fibers of the material are grasped between the closed grooves.

Peel Type Rivets

Suitable for joining plastics, rubber, wood, GRP and laminates.